

# **EMC TEST Report**

# FCC ID: H8GNB25DP18K

This report concerns (check one): Original Grant Class II Change

Issued Date: Jun. 23, 2006 Report No.: 0603C041

**Equipment:** Wireless Battery Free Optical Mouse

Model No.: NB-25D

Applicant: A-FOUR TECH CO., LTD.

Address: 6F, No.108, Min-Chuan Rd., Hsin-Tien,

Taipei, Taiwan, R.O.C.

Tested by:

Neutron Engineering Inc. EMC Laboratory

Data of Test:

Mar. 22, 2006 ~ Apr. 13, 2006

Testing Engineer

(Josh Lin)

Technical Manager

(Jeff Yang)

Authorized Signatory

Andy Chiu)

NEUTRON ENGINEERING INC.

No. 132-1, Lane 329, Sec. 2, Palain Rd., Shijr City, Taipei, Taiwan TEL: (02) 2646-5426 FAX: (02) 2646-6815

Lab Code: 200145-0







#### **Declaration**

**Neutron** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.** 

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For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Report No.: NEI-FCCP-1-0603C041 Page 2 of 25



Table of Contents	Page
1 . CERTIFICATION	4
2 . SUMMARY OF TEST RESULTS	5
2.1 TEST FACILITY	6
2.2 MEASUREMENT UNCERTAINTY	6
3 . GENERAL INFORMATION	7
3.1 GENERAL DESCRIPTION OF EUT	7
3.2 DESCRIPTION OF TEST MODES	8
3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTER	D 9
3.4 DESCRIPTION OF SUPPORT UNITS	10
4 . EMC EMISSION TEST	11
4.1 CONDUCTED EMISSION MEASUREMENT	11
4.1.1 POWER LINE CONDUCTED EMISSION	11 11
4.1.2 MEASUREMENT INSTRUMENTS LIST 4.1.3 TEST PROCEDURE	11
4.1.4 DEVIATION FROM TEST STANDARD	12
4.1.5 TEST SETUP	12
4.1.6 EUT OPERATING CONDITIONS 4.1.7 TEST RESULTS	13 14
4.2 RADIATED EMISSION MEASUREMENT 4.2.1 RADIATED EMISSION LIMITS	16 16
4.2.2 MEASUREMENT INSTRUMENTS LIST	17
4.2.3 TEST PROCEDURE	17
4.2.4 DEVIATION FROM TEST STANDARD	17
4.2.5 TEST SETUP 4.2.6 EUT OPERATING CONDITIONS	18 18
4.2.7 TEST RESULTS	19
5 . EUT TEST PHOTO	22
6 . PRODUCT LABELING	25

Report No.: NEI-FCCP-1-0603C041 Page 3 of 25



# 1. CERTIFICATION

Equipment: Wireless Battery Free Optical Mouse

Trade Name: A4TECH Model No.: NB-25D

Applicant: A-FOUR TECH CO., LTD. Data of Test: Mar. 22, 2006 ~ Apr. 13, 2006 Test Item: ENGINEERING SAMPLE

Standards: FCC Part15, Subpart C / RSS-210: 2004/ ANCI C63.4: 2003

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-0603C041) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP and CNLA according to the ISO-17025 quality assessment standard and technical standard(s).

Report No.: NEI-FCCP-1-0603C041 Page 4 of 25



# 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: (Antenna to EUT distance is 3 m)

FCC Part15, Subpart C							
Standard Test Item Limit Frequency Range (MHz) Judgmen							
15.207	Conducted Emission	Class B	0.15 - 30	PASS			
15.209	Radiated Emission	Class B	0.09 -1000	PASS			

# NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

Report No.: NEI-FCCP-1-0603C041 Page 5 of 25



# 2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **C01/OS02** at the location of No.132-1, Lane 329, Sec. 2, Palain Road, Shijr City, Taipei, Taiwan.

# 2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $\mathbf{y} \pm \mathbf{U}$ , where expended uncertainty  $\mathbf{U}$  is based on a standard uncertainty multiplied by a coverage factor of  $\mathbf{k=2}$ , providing a level of confidence of approximately 95 %  $\circ$ 

# A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U,(dB)	NOTE
C01	ANSI	150 KHz ~ 30MHz	1.94	

#### B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)	NOTE
OS01	ANSI	30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	Н	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	Н	3.94	
OS02	ANSI	30MHz ~ 200MHz	V	2.48	
		30MHz ~ 200MHz	Н	2.16	
		200MHz ~ 1,000MHz	V	2.50	
		200MHz ~ 1,000MHz	Н	2.66	

Report No.: NEI-FCCP-1-0603C041 Page 6 of 25



# 3. GENERAL INFORMATION

# 3.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Battery Free Optical Mouse			
Trade Name	A4TECH			
Model No.	NB-25D			
OEM Brand/Model No.	N/A			
Model Difference	N/A			
Product Description	The EUT is a Wireless Battery Free Optical Mouse.  Operation Frequency: 121 KHz – 128 KHz  Product Class: Class 1  Receiver Class: Class 3  Modulation Type: ASK  Antenna Designation: Integra (Induction coil)  Output Power: 2.5 mW (Max.)  Mode of Operation: Simplex  Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.			
Power Supply	Power Pad: DC 5 V, 300mA/ Supplied from PC USB port Wireless Battery Free Optical Mouse: DC 5 V, 30mA/ Faradism			
Connecting I/O Port(s)	Please refer to the User's Manual			
Products Covered	N/A			

# Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

Report No.: NEI-FCCP-1-0603C041 Page 7 of 25



# 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

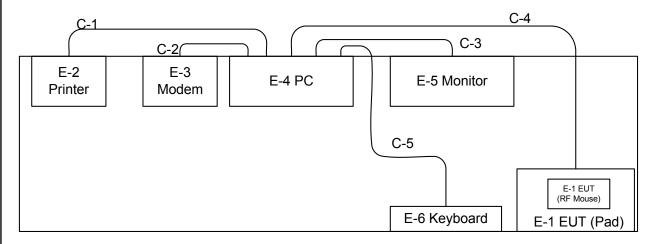
Pretest Test Mode	Description
Mode 1	121.0 KHz
Mode 2	124.5 KHz
Mode 3	128.0 KHz

For Conducted / Radiated Test					
Final Test Mode Description					
Mode 2	124.5 KHz				

Report No.: NEI-FCCP-1-0603C041 Page 8 of 25



# 3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



- C-1 Centronics Cable
- C-2 Interface Cable
- C-3 VGA Cable
- C-4 Data Cable
- C-5 Data Cable

Report No.: NEI-FCCP-1-0603C041 Page 9 of 25



# 3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Wireless Battery Free Optical Mouse	A4TECH	NB-25D	H8GNB25DP18K	N/A	EUT
E-2	Printer	SII	DPU-414	DOC	1045105A	
E-3	Modem	ACEEX	DM-1414V	DOC	8041708	
E-4	PC	IBM	8422-KVA	DOC	L3D0137	
E-5	19"TFT LCD Monitor	Samsung	SyncMaster 193T	DOC	NB19HMEX101919K	
E-6	PS/2 K/B	Logitech	Y-SJ17(ACK260A)	DOC	SYU44664880	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	YES	NO	1.8M	
C-2	YES	NO	1.5M	
C-3	YES	YES	1.8M	
C-4	YES	NO	1.5M	
C-5	YES	NO	1.5M	

# Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in <code>[Length]</code> column.

Report No.: NEI-FCCP-1-0603C041 Page 10 of 25



# 4. EMC EMISSION TEST

# 4.1 CONDUCTED EMISSION MEASUREMENT

# 4.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
PREQUENCT (WITZ)	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

#### Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

# 4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	Rolf Heine	NNB-2/16Z	98053	Dec. 19, 2006
2	4L-V-LISN	Rolf Heine	NNB-4/63TL	02/10040	Apr. 06, 2007
3	Pulse Limiter	Electro-Metrics	EM-7600	112644	Nov. 29, 2006
4	50Ω Terminator	N/A	N/A	N/A	May 11, 2007
5	Test Cable	N/A	C01	N/A	Nov. 29, 2006
6	EMI Test Receiver	R&S	ESCI	100082	Feb. 01, 2007

Remark: "N/A" denotes No Model No., Serial No. or No Calibration specified.

Report No.: NEI-FCCP-1-0603C041 Page 11 of 25



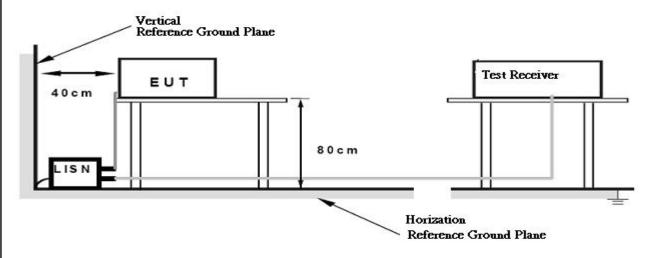
#### 4.1.3 TEST PROCEDURE

- a. The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.5 TEST SETUP



Report No.: NEI-FCCP-1-0603C041 Page 12 of 25



#### 4.1.6 EUT OPERATING CONDITIONS

The EUT exercise program used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use. The program contained on a PC hard disk and is auto-starting on power-up. Once loaded, the program sequentially exercises each system component in turn. The sequence used is:

- 1. Read (write) from (to) mass storage device (Disk).
- 2. Send "H" pattern to video port device (Monitor).
- 3. Send " H " pattern to parallel port device (Printer).4. Send " H " pattern to serial port device (Modem).
- 5. Repeated from 2 to 4 continuously.

Report No.: NEI-FCCP-1-0603C041 Page 13 of 25



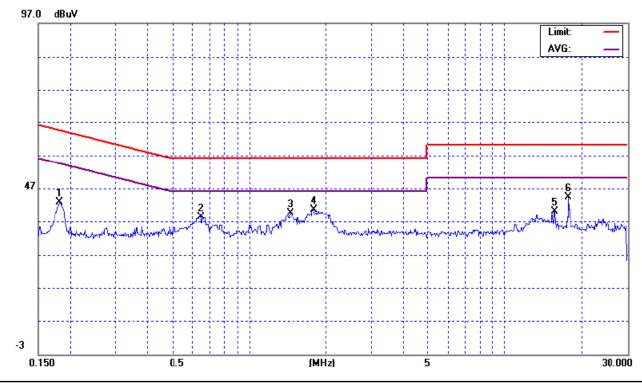
#### 4.1.7 TEST RESULTS

IEUI.	Wireless Battery Free Optical Mouse	Model No. :	NB-25D
Temperature:	<b>23.5</b> ℃	Relative Humidity:	51 %
Pressure:	1000 hPa	Test Power :	AC 120V/60Hz
Test Mode :	124.5 KHz		

Freq.	Terminal	Measured(dBuV)		Limits	(dBuV)	Margin	Note
(MHz)	L/N	QP-Mode	AV-Mode	QP-Mode	AV-Mode	(dB)	NOLE
0.18	Line	42.91	*	64.38	54.38	-21.47	(QP)
0.65	Line	38.39	*	56.00	46.00	-17.61	(QP)
1.46	Line	39.56	*	56.00	46.00	-16.44	(QP)
1.78	Line	40.55	*	56.00	46.00	-15.45	(QP)
15.69	Line	40.06	*	60.00	50.00	-19.94	(QP)
17.75	Line	44.37	*	60.00	50.00	-15.63	(QP)

# Remark

- (1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector BW=9KHz; SPA setting in RBW=10KHz, VBW =10KHz, Swp. Time = 0.3 sec./MHz  $^{\circ}$  Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=1MHz, VBW=10Hz, Swp. Time =0.3 sec./MHz  $^{\circ}$
- (2) All readings are QP Mode value unless otherwise stated AVG in column of Note ... If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform on this case, a " \* " marked in AVG Mode column of Interference Voltage Measured on the North AVG Mode column of Interference Voltage Measured on
- (3) Measuring frequency range from 150KHz to 30MHz o



Report No.: NEI-FCCP-1-0603C041 Page 14 of 25

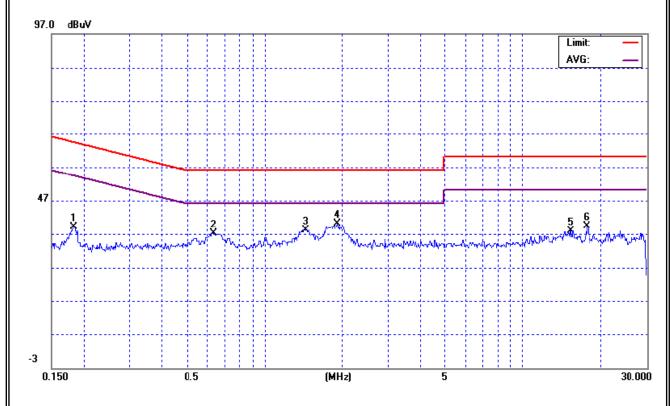


IEUI .	Wireless Battery Free Optical Mouse	Model No. :	NB-25D
Temperature:	23.5 ℃	Relative Humidity:	51 %
Pressure:	1000 hPa	Test Power :	AC 120V/60Hz
Test Mode :	124.5 KHz		

Freq.	Terminal	Measured(dBuV)		Limits(dBuV)		Margin	Note
(MHz)	L/N	QP-Mode	AV-Mode	QP-Mode	AV-Mode	(dB)	NOLE
0.18	Neutral	39.18	*	64.34	54.34	-25.16	(QP)
0.64	Neutral	37.23	*	56.00	46.00	-18.77	(QP)
1.43	Neutral	38.21	*	56.00	46.00	-17.79	(QP)
1.92	Neutral	40.02	*	56.00	46.00	-15.98	(QP)
15.31	Neutral	37.96	*	60.00	50.00	-22.04	(QP)
17.75	Neutral	39.33	*	60.00	50.00	-20.67	(QP)

#### Remark

- (1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector BW=9KHz; SPA setting in RBW=10KHz, VBW =10KHz, Swp. Time = 0.3 sec./MHz∘ Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=1MHz, VBW=10Hz, Swp. Time =0.3 sec./MHz∘
- (2) All readings are QP Mode value unless otherwise stated AVG in column of Note . If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform on this case, a " \* " marked in AVG Mode column of Interference Voltage Measured on the Note o
- (3) Measuring frequency range from 150KHz to 30MHz  $\circ$



Report No.: NEI-FCCP-1-0603C041 Page 15 of 25



# 4.2 RADIATED EMISSION MEASUREMENT

# 4.2.1 RADIATED EMISSION LIMITS

Frequency	Field Strength Limitation		Field Strength Limitation at 3m Measurement Dist			
(MHz)	(uV/m) Dist		(uV/m)	(dBuV/m)		
0.009 - 0.490	2400 / F(KHz)	300m	10000 * 2400/F(KHz)	20log 2400/F(KHz) + 80		
0.490 - 1.705	24000 / F(KHz)	30m	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40		
1.705 – 30.00	30	30m	100* 30	20log 30 + 40		
30.0 – 88.0	100	3m	100	20log 100		
88.0 – 216.0	150	3m	150	20log 150		
216.0 – 960.0	200	3m	200	20log 200		
Above 960.0	500	3m	500	20log 500		

#### Notes:

- (1) The tighter limit shall apply at the boundary between two frequency range.
- (2) Limitation expressed in dBuV/m is calculated by 20log Emission Level (uV/m).
- (3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of  $L_{d1} = L_{d2} * (d_2/d_1)^2$ . Example:

F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 3m distance is adjusted as  $L_{d1}$  =  $L_1$  = 30uV/m  $^*$  (10)  $^2$  = 100  $^*$  30 uV/m

Report No.: NEI-FCCP-1-0603C041 Page 16 of 25



#### 4.2.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Log-Bicon Antenna	MESS-ELEKTRONIK	VULB 9160	3058	Nov. 29, 2006
2	Test Cable	N/A	10M_OS02	N/A	Nov. 29, 2006
3	Test Cable	N/A	OS02-1/-2/-3	N/A	Nov. 29, 2006
4	Pre-Amplifier	Anritsu	MH648A	M09961	Nov. 29, 2006
5	EMI Test Receiver	R&S	ESCI	100082	Feb. 01, 2007
6	Antenna Mast	Chance Most	CMTB-1.5	N/A	N/A
7	Turn Table	Chance Most	CMTB-1.5	N/A	N/A
8	Loop Ant	EMCO	6502	00042960	Jan. 13, 2008

Remark: "N/A" denotes No Model No. / Serial No. and No Calibration specified.

#### 4.2.3 TEST PROCEDURE

- a. The measuring distance of at 3m or 10m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m or 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### 4.2.4 DEVIATION FROM TEST STANDARD

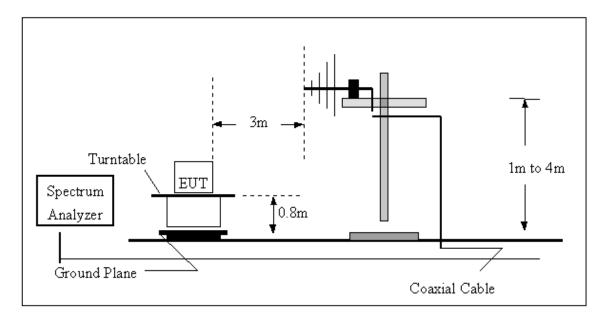
No deviation

Report No.: NEI-FCCP-1-0603C041 Page 17 of 25

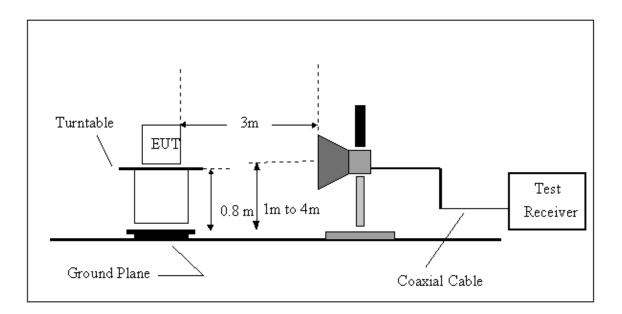


# 4.2.5 TEST SETUP

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



# 4.2.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.6** Unless otherwise a special operating condition is specified in the follows during the testing.

Report No.: NEI-FCCP-1-0603C041 Page 18 of 25



#### 4.2.7 TEST RESULTS (Below 30MHz)

ICUI.	Wireless Battery Free Optical Mouse	Model No. :	NB-25D
Temperature:	28 ℃	Relative Humidity:	56 %
Pressure:	1004 hPa	Test Power :	AC 120V/60Hz
Test distance :	3m		
Test Mode :	124.5 KHz		

Freq.	Receiver	Factor	Field	Required	Limitation	Over	Dectector
(KHz)	Reading in dBuV/m	(dB)	Strength Limit (uV/m)	Measurement Distance(m)	Converted 3m dist. (dBuV/m)	Limit	Mode PK/AV
124.50	86.21	13.00	19.28	300.00	105.70	- 6.49	Peak
249.00	52.24	12.80	9.64	300.00	99.68	- 34.64	Peak
373.50	40.49	12.80	6.43	300.00	96.16	- 42.87	Peak
498.00	38.71	12.70	48.19	30.00	73.66	- 22.25	Peak
622.50	-	12.70	38.55	30.00	71.72	-	Peak
747.00	-	12.80	32.13	30.00	70.14	-	Peak
871.50	-	12.80	27.54	30.00	68.80	-	Peak
996.00	-	12.80	24.10	30.00	67.64	-	Peak
1120.50	-	12.90	21.42	30.00	66.62	-	Peak
1245.00	-	12.90	19.28	30.00	65.70	-	Peak

#### Remark:

- (1) Spectrum Setting:
  - 9 KHz 150 KHz, RBW= 1 KHz, VBW=1 KHz, Sweep time = 200 ms.
  - 150 K Hz 30 MHz, RBW= 9 KHz, VBW=9 KHz, Sweep time = 200 ms.
  - 30 MHz 1000 MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
- (2) All receiver readings (the measured field strength levels) are measured from loop antenna directly.
- (3) The emission limits shown in the above table are base on measurements employing a quasi-peak detector except for the frequency bands 9-90 KHz, 110-490 KHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
- (4) Data of measurement within this frequency range shown " " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Report No.: NEI-FCCP-1-0603C041 Page 19 of 25



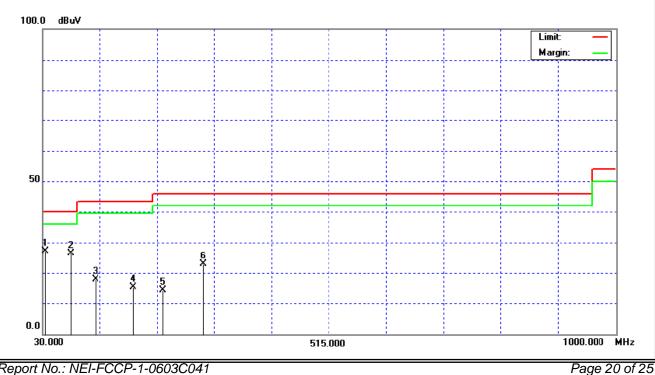
# (Between 30 – 1000 MHz)

FUI.	Wireless Battery Free Optical Mouse	Model No. :	NB-25D
Temperature:	<b>26</b> ℃	Relative Humidity:	55 %
Pressure:	1004 hPa	Test Power :	AC 120V/60Hz
Test distance :	3m		
Test Mode :	124.5 KHz		

Freq.	Ant.Pol.	DetectorMode	Reading	Ant./CL/	Actual FS	Limits 3m	Margin	Note
(MHz)	H/V	(PK/AV)	(dBuV)	Amp. CF(dB)	(dBuV/m)	(dBuV/m)	(dB)	NOLE
34.05	V	Peak	33.74	-6.50	27.24	40.00	- 12.76	(QP)
76.58	V	Peak	35.84	-9.43	26.41	40.00	- 13.59	
117.75	V	Peak	24.60	-6.78	17.82	43.50	- 25.68	
180.53	V	Peak	21.53	-6.26	15.27	43.50	- 28.23	
233.18	V	Peak	20.45	-6.05	14.40	46.00	- 31.60	
300.00	V	Peak	27.03	-4.11	22.92	46.00	- 23.08	

### Remark:

- (1) Spectrum Setting:
  - 9 KHz 150 KHz, RBW= 1 KHz, VBW=1 KHz, Sweep time = 200 ms. 150 K Hz - 30 MHz, RBW= 9 KHz, VBW=9 KHz, Sweep time = 200 ms. 30 MHz - 1000 MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
- (2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measure-ment didn't perform o
- (3) Measuring frequency range from 30MHz to 1000MHz(@10m) o
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not how in table ∘



Report No.: NEI-FCCP-1-0603C041

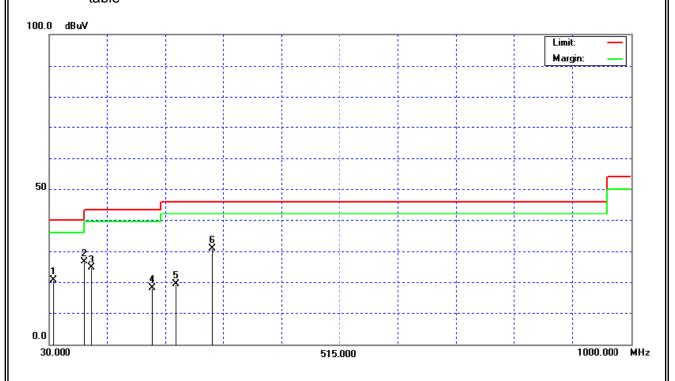


ICUI.	Wireless Battery Free Optical Mouse	Model No. :	NB-25D
Temperature:	<b>26</b> ℃	Relative Humidity:	55 %
Pressure:	1004 hPa	Test Power :	AC 120V/60Hz
Test distance :	3m		
Test Mode :	124.5 KHz		

Freq.	Ant.Pol.	DetectorMode	Reading	Ant./CL/	Actual FS	Limits 3m	Margin	Note
(MHz)	H/V	(PK/AV)	(dBuV)	Amp. CF(dB)	(dBuV/m)	(dBuV/m)	(dB)	Note
36.08	Н	Peak	27.05	-6.50	20.55	40.00	- 19.45	
86.03	Н	Peak	36.76	-10.08	26.68	40.00	- 13.32	
100.20	Н	Peak	33.47	-8.82	24.65	43.50	- 18.85	
200.10	Н	Peak	25.75	-7.56	18.19	43.50	- 25.31	
239.93	Н	Peak	25.21	-5.82	19.39	46.00	- 26.61	
300.00	Н	Peak	34.99	-4.11	30.88	46.00	- 15.12	

#### Remark:

- (1) Spectrum Setting:
  - 9 KHz 150 KHz, RBW= 1 KHz, VBW=1 KHz, Sweep time = 200 ms. 150 K Hz – 30 MHz, RBW= 9 KHz, VBW=9 KHz, Sweep time = 200 ms. 30 MHz – 1000 MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
- (2) All readings are Peak unless otherwise stated QP in column of  $\lceil$ Note $_{
  m J}$ . Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measure-ment didn't perform  $_{
  m O}$
- (3) Measuring frequency range from 30MHz to 1000MHz(@10m) o
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not how in table ∘



Report No.: NEI-FCCP-1-0603C041 Page 21 of 25